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STATE OF ISRAEL

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נכונים של המסמכים
שהופקדו לבתחילה
עם חבקשה לפטנט
לפי הפרטים הרשומים
בעמוד הראשון של
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PRIORITY DOCUMENT

This 18 -11- 1997 היום

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נתאשר

חוק הפטנטים, תשכ"ז — 1967
PATENT LAW, 5727 - 1967

בקשה לפטנט
Application for Patent

לשימוש הלשכה
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אני, (שם המבקש, מענו ולגבי גוף מאוגד - מקום התאגדותו)
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בעל אמצאה מכח היותו הממציא
Owner, by virtue of being the inventor

שטמה הוא
of an invention the title of which is

(בעברית) (Hebrew) שיטה והתקן לייצור יונים

(באנגלית) (English) METHOD AND APPARATUS FOR THE GENERATION OF IONS

מבקש בזאת כי יתן לי עליה מטנט
hereby apply for a patent to be granted to me in respect thereof.

• בקשת חלוקה — Application of Division	• בקשת פטנט מוסף — Application for Patent Addition	• דרישה דין קדימה Priority Claim		
מבקשת פטנט from Application	• לבקשה/לפטנט to Patent/Appl.	מספר/סימן Number/Mark	תאריך Date	מדינת האגוד Convention Country
No. מס'	No. מס'			
dated יום	dated יום			

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P.O.A.: general/individual-attached/to be filed later-

filed in case תוגש בענין

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COHEN ZEDEK & RAPAPORT
By

This 13th day of November 1996
היום 13th בחודש November שנת 1996
of the year

לשימוש הלשכה
For Office Use

טופס זה, כשהוא מוטבע בחותם לשכת הפטנטים ומושלם בסמי ובתאריך ההגשה, הנו אישור להגשת הבקשה שפרטיה רשומים לעיל.

METHOD AND APPARATUS FOR THE GENERATION OF IONS

שיטה והתקן לייצור יונים

METHOD AND APPARATUS FOR THE GENERATION OF IONS

The invention relates to a method and a device for ion generation from air by means of a corona discharge between an active and an inactive electrode (sharp point opposite a torroid).

BACKGROUND

It is known that besides ions, neutral ozone molecules are simultaneously produced in the field of a corona discharge.

In the conventional method and devices, ions are removed from the corona system by means of an air flow from a fan or a compressor. Simultaneously the ion flow direction to the generator exit coincides with that of the air flow.

Due to the great difference between the speed of the air flow and that of the ions in the field of a corona discharge, a significant part of ions remains inside the system. Thus by the known method and known devices, the coefficient of ion removal from the generator (the ratio of the ions quantity at the output of the generator to the number of ions produced by the generator) remains rather low.

At the same time together with ions the whole amount of ozone produced in the corona system is also removed by the air flow.

Amongst purposes of the invention:

1) to achieve a higher coefficient of ion exit from the device, and,

2) the annihilation of ozone produced in the corona system.

According to the invention, electrodes are part of the device, having at least one opening for the removal of ions to the exterior, and an opening in a different direction for ozone withdrawal out of the corona discharge field.

An inactive electrode, advantageously in ring shape, is placed near an opening for ion removal, while the active electrode (needle) is inside the device, opposite the inactive electrode.

The opening for ozone removal is located close to the corona discharge field.

Constant voltage of the polarity conforming the required ion polarity is supplied to both active and inactive electrodes (relative to the earth).

Simultaneously a high pulse voltage of determined frequency is applied to the active electrode relative to the inactive one, with voltage polarity corresponding the required ion polarity. The duration of the high voltage pulse, at the particular amplitude is chosen to be shorter than the time it takes the ions to reach the inactive electrodes. During the high voltage pulse

positive and negative ions as well as neutral ozone molecules are produced near the sharp point of the active electrode.

Under the effect of the electric field forces ions begin moving from the active to the inactive electrodes, the speed of the movement begin rather high. (1-2cm/sec per volt).

The duration of high voltage pulse under the particular amplitude, is chosen to be shorter than the time it takes the ions to pass from the active to the inactive electrodes, and thus during the period of the pulse duration the ions cannot reach the inactive electrode.

When the pulse period ceases, an equal potential is applied to both electrodes, and as the polarity of the potential and that of the ions is the same, ions continue moving between the electrodes due to inertia even though there is no electric field.

When the ions exit through the inactive electrode (ring), the voltage on the ring acts to focus them and prevents the settling of ions on the electrode, and thus a high coefficient of ions removal is achieved.

At the same time ozone produced in the corona system is removed with air by means of a fan or compressor, through the ozone outlet and can be neutralized by means of adsorbtion (e.g., activated carbon), and thus there is

no ozone in the ion stream. An adsorbing filter can be placed between the opening for the ozone and the fan. The device as illustrated in wiring diagram Figure 1, for the realization of the suggested contains a housing (1) including a fan (or a compressor) (2), an adsorbing filter (3) an active electrode (5), and an inactive electrode (6).

In the housing there are at least: one opening for the ion exit (7) and one opening for the ozone (4). The inactive electrode (6) surrounds the opening (7) while the active electrode is opposite the inactive one (6), the adsorbing filter (3) is between the opening for the ozone removal (4) and the fan (2). The power is supplied to the fan by means of wires (8) and the fan (2) is placed in the housing (1) so that the air flow generated by it is directed from the ion removal opening (7) to the ozone removal opening (4). The pulse and direct voltages necessary for the novel method is produced by commutation of the current flowing through the primary winding (15) of the high voltage pulse transformer (9) from the direct voltage source (17). Transistor (13) is used as a commutating element. Damping diode (14) presents the ejection of the reversed polarity voltage.

The pulse frequency is determined by the pulse generator of commutation (11). The clamp (10) of the generator (11) is connected to the base of transistor (13) whole collector is connected to the cathode of diode (14) and to the end of the primary winding (15) of the transformer (9). The front end of the winding (15) is connected to the positive clamp (16) of the direct voltage

source (17), while its negative clamp (18) is connected to the anode of diode (14), to the transistor (13) emitter and to the clamp (19) "earth" and to the clamp (12) of the generator (11).

The pulses produced on the primary winding (15) are raised by the transformer (9) and a high pulse voltage is applied to the secondary windings (20) an of the high voltage pulse (21) of transformer (9).

The front end of the winding (20) is connected to the active electrode (5) and the end of it to the inactive electrode (6), to the front end of the winding (21) and to one of the plates of capacitor (23). The second plate of capacitor (23) is connected to the cathode of diode (22) and by resistor (24) to the terminal (19) "earth". The anode of diode (22) is connected to the end of winding (21).

The pulse voltage on winding (21) charges the capacitor (23) up to the peak value, and the capacitor (23) acts as direct voltage source.

For safety, in order to limit the electric current intensity there is provided resistor (24).

Below is an example of a variant of the device:

The distance between the active and inactive electrodes is in the order of .5mm.

The high voltage pulses parameters can be the following:

1) Amplitude	6 KV.
2) Duration	1 microsecond.
3) Frequency	5.0 KHz.

The direct voltage supplied to the electrodes 2.4 KV.

Ion removal coefficient	80%

The fan (or compressor) efficient issue of 200 liter/hour.

Ion current is 1 microampere.

A current increase can be achieved both by amplitude and frequency of high voltage pulses increase and by arrangement of several active and inactive electrodes in the housing.

CLAIMS:

1. A method of high efficiency generation of ions of desired polarity, which comprises positioning a needle shaped active electrode opposite a torroid inactive electrode, applying a direct voltage to both electrodes relative to earth, at the same time applying high voltage pulses to the active electrode relative to the inactive one, the duration of the pulses being shorter while their succession period is longer than the time of the ion flight between the electrodes at the given pulse amplitude.

2. A method according to claim 1, where the polarity of the voltage applied to both electrodes either continuously or in the intervals between the high voltage pulses and the polarity of the generated ions are the same.

3. A method according to claims 1 or 2, where the coefficient of ion removal is regulated by changing the magnitude of direct voltage supplied to the electrodes.

4. A method for the generation of a stream of ions, devoid of ozone, which comprises positioning a needle shaped active electrode opposite a torroid inactive electrode which comprises passing an airstream through a corona discharge which is established between an active and an inactive electrode, where the airstream with the ozone is deflected to a direction different from that to the flow of ions.

5. A method according to Claim 4, where the airstream with the ozone is passed through a suitable filter for ozone removal.

6. A device for the high efficiency generation of ions of desired polarity comprising a needle shaped active electrode located at a certain distance from an inactive electrode, means for applying direct voltage to both electrodes relative to the earth as well as the means for applying high voltage pulse to the active electrode relative the inactive one, the pulse duration being shorter while the pulse intervals are longer than the time of the ion flight between the electrodes at the given amplitude.

7. A device according to claim 6, where means exist to apply a voltage to both electrodes, either continuously or in the intervals between high voltage pulses, providing the same polarity of the voltage and of the generated ions.

8. A device for the generation of a stream of ions devoid of ozone comprising a needle shaped active electrode located at a certain distance from an inactive electrode, means for establishing a coronoa discharge between an active and an inactive electrodes, comprising also an opening for the ozone removal, as well as the means for the formation of an airstream, removing ozone out of the corona discharge zone in the direction from the inactive electrode to the opening for the ozone removal, this direction being different from that of the ion flow resulting in the ion flow devoid of ozone.

9. A device according to Claim 8 contains an adsorbing filter for ozone neutralization, placed between the ozone removal opening and the fan.

10. A device according to Claim 9, where means are provided for neutralizing the ozone before it leaves the system, thus converting it to oxygen molecules.

[illegible]
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One Sheet Only

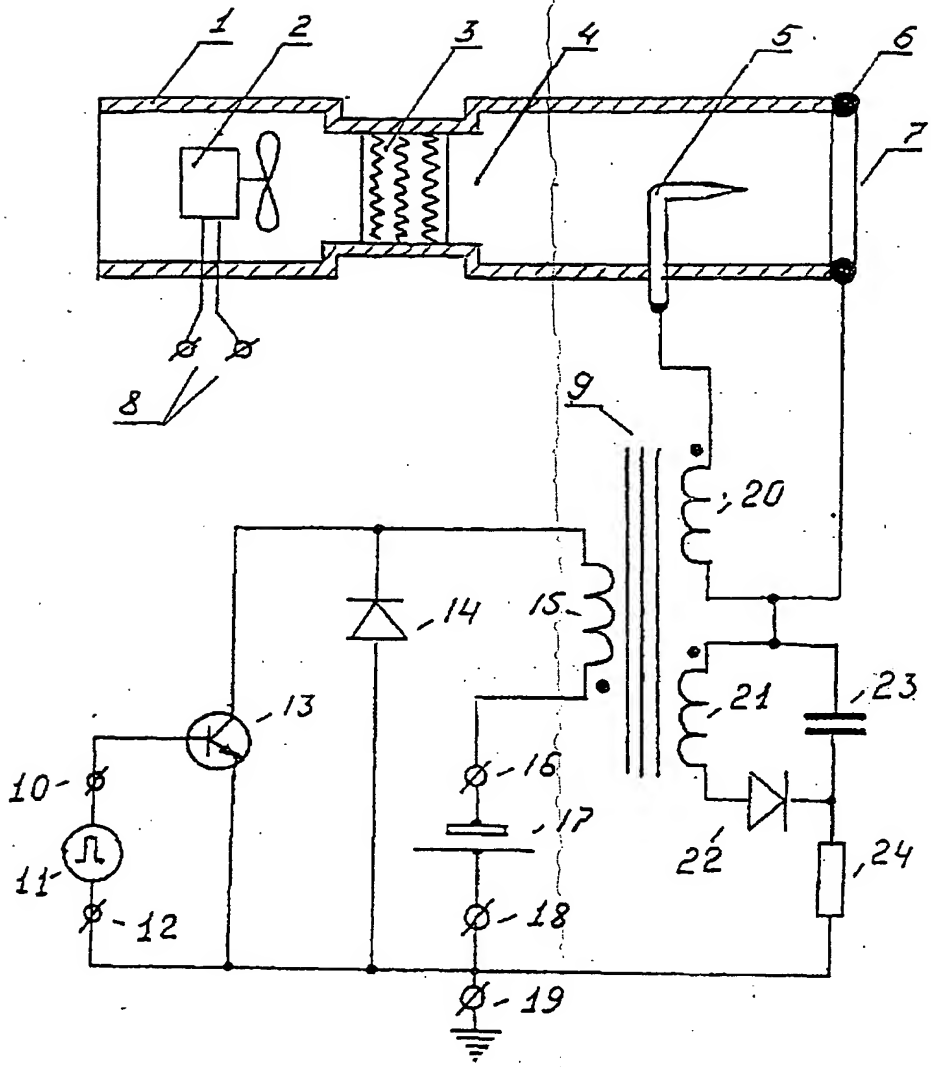

Fig 1.